The Canadian Occupational Projection System

THE CANADIAN OCCUPATIONAL PROJECTION SYSTEM

COPS

HUMAN RESOURCE PROFILE OF THE PULP AND PAPER SECTOR

Prepared by: Employment and Immigration Canada
Strategic Policy and Planning
Labour Market Outlook and Structural Analysis

In Collaboration with: The Canadian Forestry Service
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TABLE OF CONTENTS

Table of Contents. i
Preface. ii
Executive Summary. iii

INTRODUCTION 1

I SECTOR DEFINITION AND PROFILE 2
- sector definition 2
- national profile. 3
- regional profile. 5

II MAJOR ISSUES. 7

III SECTOR OUTLOOK. 11
- output. 11
- productivity. 12

IV EMPLOYMENT AND OCCUPATIONAL INFORMATION 14
- occupational profile. 16
- labour market conditions at the occupational level. 18

APPENDIX I: SECTOR REPRESENTATIVE QUESTIONNAIRE A-1

APPENDIX II: COPS - AN IN-DEPTH VIEW A-4

APPENDIX III: COPS IMPACT SCENARIOS SUMMARY A-6

APPENDIX IV: OCCUPATIONAL DEFINITIONS. A-11

APPENDIX V: OCCUPATIONAL PROFILE. A-18

APPENDIX VI: INDUSTRY AND WAGE PROFILE A-21

PREFACE

This document has been prepared by the staff responsible for the Canadian Occupational Projection System (COPS) at Employment and Immigration Canada in collaboration with the Canadian Forestry Service. A series of interviews in November-December, 1986 with representatives of companies, unions, and associations in the sector provided valuable comments on the information contained herein.

This report provides a profile of the pulp and paper sector and presents projections of possible future courses the sector may take. Projected future occupational requirements of the industry are then tied to its anticipated performance.

The goal of the report is to provide a resource document as an aid in human resource planning over the medium term, i.e., until 1992.

We gratefully acknowledge the contribution of those who took part in the consultative process.

EXECUTIVE SUMMARY

The pulp and paper sector is a large economic actor in Canada. With approximately 150 mills across the country, it directly employs about 93,000 people as of 1987, and is first on the list of top ten manufacturing industries in terms of value-added. Moreover, Canada is the world's largest producer and exporter of newsprint, and the world's top exporter of wood pulp. In short, exports of the pulp and paper sector provide the single largest contribution to Canada's balance of payments.

In order to retain and expand its position in the Canadian economy as a major producer and employer, the sector must effectively respond to the challenges it faces from technological advances, changes in forest management, and changes in the world economy.

Technological changes are having a great impact on employment levels in, and the employment profile of, the sector. One of the most important technological advances has been the introduction of the thermomechanical pulping process. The process results in stronger pulp than in conventional mechanical pulping processes, the yield is much higher than that of the chemical pulping process, it uses fewer chemicals, and will allow for the use of hardwoods. Although the process currently uses greater quantities of energy, it has the potential to reduce this level through the adoption of steam-recovery equipment. While there are many benefits to be gained from it, the thermomechanical process has also meant the loss of handling jobs in areas where it has been introduced. Faster machines, automation of many processes, and computerized process and distribution controls are other advances which will increase productivity, but which will also mean fewer jobs, especially the lower-skilled jobs. These losses will be partially offset by jobs created and augmented in other areas such as the production of high value-added goods.

Because many pulp and paper products are exported, changes in the world economy have a great impact on the sector's fortunes. These include:

- competition in the sector's traditional markets from developing and

newly-developed countries, which can manufacture products of an acceptable quality at much lower costs;

- volatile exchange rates which can make the sector's prices uncompetitive overnight;
- rising protectionism;
- free trade negotiations taking place between Canada and the United States.

These are all global issues in which the sector has little direct input, but which have a great impact on it.

The state of the forest resource is also of relevance to the pulp and paper sector. The major issues in forest management include: a continued supply of economically accessible trees for the forest industry; the use of forests for recreational and other purposes; the potential new employment opportunities that intensive forest management could provide; and lastly, the question of who is going to pay for the significant investment forest management requires.

The future health and employment levels of the pulp and paper sector depend upon the progress and outcome of these important issues. It is certain that the sector's employment profile will continue to change. If human resource planning is to be effective in these times of changing employment structures, the methods we use to measure employment through occupational categories must keep up to, and anticipate changes in, occupational categories.

HUMAN RESOURCE IMPLICATIONS

Like so many sectors of the Canadian economy, the recession and rationalization of enterprises has had a major effect on employment levels in the pulp and paper sector. Employment has fluctuated from over 100,000 in 1980 to less than 90,000 in both 1983 and 1985, and as of 1987, stands at about 93,000. Future employment growth is expected to be slow, and is not expected to reach 1980 levels.

The pulp and paper sector sees a permanent shift away from lower-skilled to higher multi-skilled employees and a continued emphasis on increased productivity. Greater emphasis will be placed on upgrading skills and retraining

the existing workforce. As more and more processes are mechanized and production controls are automated, the labour force will change so that, for example, some production workers will turn to monitoring computerized equipment and people in traditional repair trades such as electricians and mechanics will have their skills upgraded to encompass new mechanized processes and electronics. An increase in jobs in such occupations as engineering and electrical technicians, and the creation of new occupations such as that of the electronic electrician will partially offset employment decreases in other areas. Wherever possible, elements of production will be integrated, requiring new skills for supervisory staff and resulting in a demand for process oriented engineers and technicians. Impacts of these developments will also be felt in the office, where professionals will have their skills upgraded in computerized inventory, accounting and production management areas, while some clerical and other workers, whose jobs can be computerized, will have to be retrained and redeployed.

This document reports on the comments of the pulp and paper sector on future occupational projections presented by COPS and profiles major issues that COPS, in collaboration with the Canadian Forestry Service consider to be central to successful human resource adjustment in the sector. As such, the intention is to provide an information source to assist the federal government, as well as industry, labour unions and those involved in education and training, in developing policies and programmes that will lead to effective human resources planning and adjustment.

HUMAN RESOURCE PROFILE OF THE PULP AND PAPER SECTOR

INTRODUCTION

The Canadian economy is changing rapidly. Daily advances in technology, the globalization of the marketplace, the possibility of a free trade agreement with the United States, the volatility of currency exchange rates, threats of protectionism, low prices for our natural resources... all of these factors are changing the way Canadians live and do business. The forest products industry, as Canada's largest manufacturing industry, must understand these changes in order to adapt itself to them.

The purpose of this study is to examine how these rapid changes will affect human resource requirements in the pulp and paper industry, so that government, industry, labour unions and those involved in education and training can develop effective human resource policies.

To help meet that requirement, Employment and Immigration Canada's statistical model, the Canadian Occupational Projection System (COPS), acquired detailed employment information at both the industrial and occupational levels, and generated projections of occupational requirements to the year 1992. These projections consist of a set of scenarios that reflect a range of possible future economic conditions.

These projections were then presented to sector representatives for their input, and their views and comments are incorporated into this report.

The first two sections of this report contain a profile of the sector and an analysis of major issues facing it, followed by a general outlook for the sector to the year 1992, and a section on employment and occupational information. Detailed information on the COPS study, its assumptions, and its conclusions can be found in the Appendices.

I. SECTOR DEFINITION AND PROFILE

SECTOR DEFINITION

The pulp and paper sector of the forest products industry is made up of companies primarily engaged in manufacturing pulp, paper, paperboard and building and insulation board. The sector is further divided into the following sub-sectors defined by the Standard Industrial Classification (SIC) Manual (1970):

S.I.C. 271 SUB-SECTORS

2711 PULP INDUSTRY

Establishments primarily engaged in manufacturing mechanical, semi-mechanical and chemical wood pulp for sale as such.

2712 NEWSPRINT INDUSTRY

Establishments primarily engaged in manufacturing newsprint and groundwood printing paper.

2713 PAPERBOARD INDUSTRY

Establishments primarily engaged in manufacturing paperboard and building paper.

2714 BUILDING BOARD INDUSTRY

Establishments primarily engaged in manufacturing building board.

2719 OTHER PAPER INDUSTRIES

Establishments primarily engaged in manufacturing fine, specialty and sanitary papers.

NATIONAL PROFILE

The pulp and paper sector plays an important role in the Canadian economy. In terms of value of shipments, the sector is third on the list of the top ten manufacturing industries in Canada between 1980-82. In terms of value-added, it ranks first.

Canada is the world's largest producer and exporter of newsprint, and is the leading exporter of wood pulp. In 1986, shipments of pulp, paper, and paperboard set a new record, totalling 23.2 million tonnes according to the Canadian Pulp and Paper Association (CPPA), an increase of 7% from 1985. CPPA figures show that these shipments were valued at about $14 billion, and that exports accounted for about $11 billion. This represents one of the single largest contributions to Canada's balance of payments.

Approximately three quarters of the products of the pulp and paper sector are exported, and most of these exports go to the United States. In 1985, the American market consumed 84% of Canada's newsprint exports. The largest domestic customer for its products is the printing, publishing and allied products industry, which took about 12% of the sector's shipments in 1981.

Major costs for the pulp and paper sector include labour, raw materials, industrial chemicals, electric power and transportation. Sector representatives stress the continued need to implement cost savings in order to remain competitive. Labour costs have been reduced in recent years, and the shift to the thermomechanical pulping process should result in lower industrial chemical costs. On the other hand, consumption of electric power has increased slightly in recent years.

The large dominant companies involved in all aspects of the industry from their own logging units through to the production of fine papers have the economies of scale as well as the flexibility to implement changes to their production processes and have the size to enhance cost savings through large scale lower unit cost purchasing. Representatives also mentioned that some companies are spinning off or contracting out to a greater degree for logging

inputs. The ability of large companies to invest in new cost-saving equipment and processes is also superior to that of smaller operations. These developments, according to some representatives, will weed out less profitable companies and allow the large companies to compete in world markets, while smaller operations which restructure and modernize will be able to retain their domestic presence in niche markets.

The pulp and paper sector employs about 93,000 people as of 1987, with pulp and newsprint manufacturing accounting for most of the jobs. Table 1 below shows that in 1984, the latest year for which the appropriate data are available, employment in these two areas comprised 73% of total employment in the sector. The sector also creates significant spin-off employment effects in other sectors of the economy. In 1979, for example, for every person employed directly in the pulp and paper industry, there were 2.2 people employed elsewhere in the economy as a result of the industry's activity. This multiplier is one of the highest of major Canadian industries.

TABLE 1

EMPLOYMENT STRUCTURE OF THE
PULP AND PAPER INDUSTRY (1984)

	SIC CODE	EMPLOYMENT #	% share
Pulp Industry	2711	21,183	23.0
Newsprint Industry	2712	46,050	50.0
Paperboard Industry	2713	9,210	10.0
Building Board Industry	2714	921	1.0
Other Paper Industries*	2719	14,736	16.0
TOTAL		92,100	100.0

*This industry includes establishments primarily engaged in manufacturing fine, specialty and sanitary papers.

Note: The distribution is based on the Census of Manufacturers and the employment levels come from the Labour Force Survey.

Source: Statistics Canada; Census of Manufacturers, adjusted to the Labour Force Survey.

REGIONAL PROFILE

Manufacturing establishments and employment in the pulp and paper sector are concentrated in Quebec and Ontario, followed by British Columbia. Together, Quebec and Ontario accounted for 68% of the total number of pulp and paper mills and 65% of the jobs in 1984. About 17% of the total number of establishments were located in British Columbia, along with about 20% of the sector's jobs. Together, the three major producing provinces account for over 80% of the jobs in the sector.

A further 14% of establishments and about 12% of pulp and paper jobs were located in New Brunswick, Nova Scotia and Newfoundland, while Manitoba, Saskatchewan and Alberta accounted for less than 4% of total establishments, and about 2% of total jobs.

TABLE 2

GEOGRAPHIC DISTRIBUTION OF EMPLOYMENT
PULP AND PAPER SECTOR

Province	Percentage Employment			Absolute Level			Percentage Contribution to Employment Growth or Decline ( )	
	1976	1984	1992	1976	1984	1992	1976-84	1984-92
Nfld.	3.6	3.1	2.3	3,700	2,900	2,297	(6.7)	(39.3)
P.E.I.	---	---	---	---	---	---	---	---
N.S.	2.3	2.7	4.5	2,400	2,500	4,558	100	22.1
N.B.	6.1	6.7	6.4	6,300	6,200	6,371	(0.8)	1.9
Que.	38.0	38.6	40.4	39,100	35,500	40,449	(30.3)	53.1
Ont.	22.8	26.2	25.0	23,500	24,100	25,069	(5.0)	10.4
Man.	3.1	0.6	1.1	3,200	629	1,088	(21.6)	4.9
Sask.	0.7	0.2	0.3	764	164	314	(5.0)	1.6
Alta.	1.2	1.2	1.7	1,236	1,107	1,673	(1.1)	6.1
B.C.	22.1	21.0	18.3	22,800	19,300	18,369	(29.4)	(60.7)
TOTAL	100	100	100	10,3000	92,400	100,188		

Source: Canadian Occupational Projection System

As Table 2 shows, almost all provinces experienced a decline in employment from 1976 to 1984, with Quebec and British Columbia posting the largest losses. The projections for 1984 to 1992 indicate that Nova Scotia and Quebec are expected to be the provinces where strongest employment growth will occur. But the overall distribution of employment by province will remain more or less the same.

TABLE 3

GEOGRAPHIC DISTRIBUTION OF OUTPUT
PULP AND PAPER SECTOR

Province	Percentage Output			Absolute Level			Percentage Contribution to Output Growth or Decline ( )	
	1975	1984	1992	1975	1984	1992	1975-84	1984-92
Nfld.	2.1	2.3	2.0	21.3	32.3	37.1	2.8	1.0
P.E.I.	---	---	---	---	---	---	---	---
N.S.	3.6	3.2	2.8	36.5	45.1	53.1	2.2	1.7
N.B.	5.6	5.1	4.5	56.9	70.8	84.4	3.5	2.8
Que.	30.3	36.6	37.2	307.2	513.5	697.9	52.4	38.6
Ont.	31.5	26.7	26.6	319.4	374.7	500.0	14.0	26.2
Man.	1.9	1.1	1.1	19.3	15.7	21.3	(69.2)	1.4
Sask.	0.9	0.5	0.5	9.1	7.5	10.3	(30.8)	0.6
Alta.	2.4	1.8	1.9	24.3	25.5	35.7	0.3	2.1
B.C.	21.6	22.6	23.4	219.0	316.4	438.8	24.7	25.6
TOTAL	100	100	100	1,013.0	1,401.5	1,878.6		

Source: Canadian Occupational Projection System

The regional nature of the pulp and paper sector must be emphasized. Wood pulp production in the central Canadian provinces is almost exclusively destined for use in manufacturing boards and papers, primarily newsprint. British Columbia, however, is a major supplier of market pulp -- pulp that is sold directly in international markets without further processing into paper by the parent company. Almost 60% of British Columbia's pulp production is sold as market pulp.

II MAJOR ISSUES

The pulp and paper sector faces a number of challenges in Canada's rapidly changing economy. Its future performance and employment levels will depend upon how the sector responds to them. Technological change and developments in the global economy are at the root of many of these challenges, while the supply of forest resources accounts for another set of issues to be addressed.

One of the most important technological developments, according to pulp and paper representatives, is the introduction of thermomechanical pulping processes. In the regular mechanical pulping process, logs are shredded on a grindstone, or wood chips are ground to fibres between pairs of rotating discs in a refiner. In chemical pulping, the fibres are freed by cooking the wood in a chemical solution in a pressure cooker. The advantage of the chemical process is that it produces stronger pulp.

In the thermomechanical pulping processes, the refiner is kept under pressure at temperatures up to 120 degrees Celsius; this results in longer fibres, and therefore, stronger paper, than can be produced with the regular mechanical pulping processes. Moreover, mechanical pulp contains all the components of wood, so that its yield is 95% or more, of the original wood, while the yield of chemical pulp can be as low as 45% of the weight of the wood. The shift to the thermomechanical process will result in better resource use. The process can also reduce energy consumption, and allow for increased use of hardwoods. The increased use of the thermomechanical pulping process should also result in less use of industrial chemicals. This would not only reduce spending on the chemicals, it can also reduce pollutants, and thus, waste management expenses.

The thermomechanical pulping process will also mean lower employment, as the process will eliminate some handling jobs. This has already happened in Quebec and Ontario, and is now taking place in New Brunswick.

Another technological improvement is the introduction of new paper making machines that are more automated, faster, and that allow paper to dry faster.

These machines will increase productivity, and, like the introduction of the thermomechanical pulping process, will reduce jobs.

Automation of many processes and computerized process and distribution control are other developments which will increase productivity. These advances will lead to more jobs in some occupations, but other occupations, especially lower-skilled ones, will experience employment declines.

Changes in the global economy will deeply affect the pulp and paper sector because so much of its production is exported. One of the greatest challenges the sector faces is from developing and newly-developed countries, some of which are former customers, now competing with Canada in its traditional markets. Many of these countries have faster-growing forests, and can produce newsprint of an acceptable quality at a much lower cost. These new competitors have contributed to the approximate 27% increase between 1970 and 1981 in the world production capacity of the pulp and paper sector. This increased competition is not currently having adverse effects on Canadian producers since the sector in Canada is at present operating at 100% capacity.

If the pulp and paper sector is to maintain and increase its market share, it must adjust to these new competitors, by decreasing production costs if possible, and also by shifting production from primary manufactured products to higher value-added products which are more market specific. The sector has long realized this need, but as one representative commented, it is time for action in this area, instead of just words. Actions, however, are much more difficult than words.

Volatile exchange rates and the threat of protectionism are also important to the pulp and paper sector because of its large number of foreign customers. While the lower value of the Canadian dollar has made the sector's prices more competitive internationally, this situation can change very quickly. If the value of the Canadian dollar rises, or if the value of a competitors' currency suddenly falls, the pulp and paper sector will have a tougher time selling in world markets.

Protectionism also has a large impact on the ability of the pulp and paper sector to sell its products abroad. While access to the American market is relatively free, recent U.S. countervail activity, the softwood lumber deal reached with Canada whereby some softwood lumber shipments to the United States are taxed 15%, and growing American support for protectionism in general, threaten this access. Protectionism in other countries, such as the use of non-tariff barriers to imports by the European Economic Community, is another issue of concern to some sector representatives.

The free trade negotiations which are being undertaken between Canada and the U.S. are another important issue facing the pulp and paper industry. It is not clear exactly what effects such an agreement, if one were to be reached, would have. It is possible that Canada's traditional pulp and paper exports would benefit, while some of the sector's products, such as fine and specialty papers, which serve mainly the domestic market and which enjoy tariff protection, would suffer if tariffs were removed without a phase-in period.

The pulp and paper sector cannot directly influence these global issues, other than to make its concerns known to the federal government. But on another major issue area, that of forest resource management, the sector has much more influence.

The pulp and paper sector, along with the other sectors of the forest industry and governments, must put more thought and resources into ensuring that there will continue to be an adequate supply of trees, both for the industry, and for recreational and other purposes. The practice of intensive forest management is the route to ensuring an economically accessible wood supply. It is made up of three parts:

- planning and administration, which includes mapping, inventory, and calculating the allowable annual cut;
- silviculture, which includes site preparation, seeding, planting, thinning and other "gardening" functions;

- protection, which encompasses disease, fire and pest control.

World demand for forest products is growing. The Food and Agriculture Organization of the United Nations estimates that world consumption of paper and paperboard will be about 260 million metric tons by 1990, compared with about 175 million metric tons consumed in 1980. Increasing literacy around the world is one of the factors behind the expected increase in demand for paper. The supply of softwood timber, the type of wood that grows best in Canadian forests, is gradually tightening. However, Canada is capable of increasing the present wood harvest, through the application of intensive forest management. Sweden, for example, has been practising intensive forest management for forty years, and harvests three to four times more wood per hectare.

Intensive forest management will ensure a continued supply of forest resources and is expected to create new jobs and occupations. It can increase productivity through genetically improved and more plentiful trees.

The future well-being and employment levels of the pulp and paper industry depend upon the progress and outcome of these important issues. It is certain that the sector's employment profile will change, as jobs lost due to such factors as technological advances are offset to some degree by jobs created in other areas, such as gathering and handling waste paper to be recycled, or production of higher-valued products. While the challenges posed by technological changes and the effects of a declining forest resource supply can be taken directly into account by human resource policy developers, those posed by changes in the global economy will be even more difficult to adjust to, and can be dealt with best by government's awareness of the sector's concerns in these areas.

III OUTLOOK FOR THE PULP AND PAPER SECTOR

Based on 1985 projections made by Data Resources Inc. (DRI), the demand for pulp and paper products is expected to be quite strong into the 1990s. DRI suggested that world demand for market pulp would rise almost 5% annually from 1987 to 1989. The strong demand for wood pulp should be supported by:

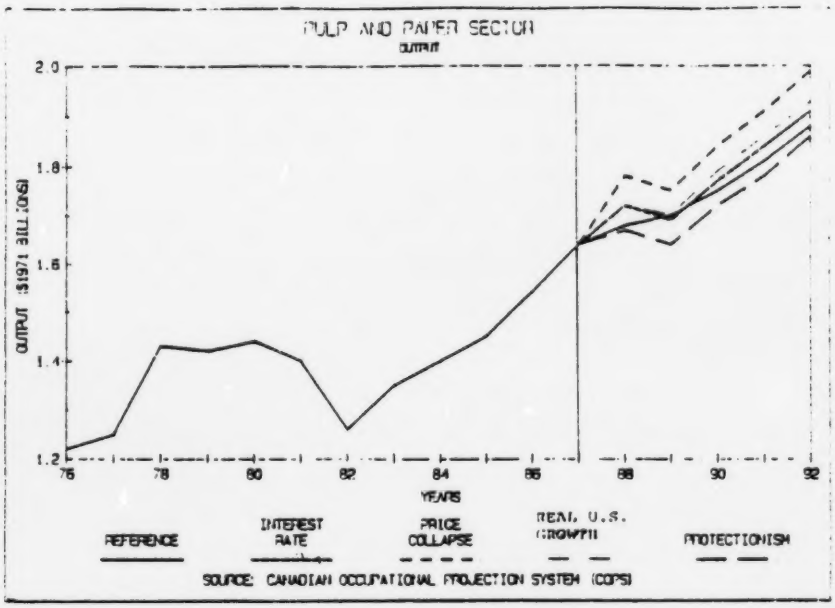
- solid world-wide economic growth (this, in fact has not happened in the first quarter of 1987);
- slowing secondary fibre substitution in Western Europe and Japan;
- technical advances in pulp production which will help keep costs down, and therefore, prices competitive.

Moreover, DRI expects world demand for printing, writing, and tissue papers to grow faster than the world economy as a whole.

Canadian newsprint shipments are not expected to grow as rapidly. According to Canadian Pulp and Paper Association figures, newsprint shipments declined slightly in 1985, but rose 3% in 1986. While growth in newsprint shipments is expected to be even stronger in 1987, DRI believes it will level off in the years after that, and that average yearly growth will be 1.7%. This low growth will be caused partly by the swing in both capacity and demand to higher quality grades of paper which are not classified as newsprint. Moreover, Data Resources Inc. expects Canadian shipments of newsprint to suffer from the gain that overseas suppliers have made in the American market.

OUTPUT

As shown in the graph below, output growth in the pulp and paper sector fell sharply with the onset of the recession, but recovered rapidly. COPS expects output growth to average 3.7% annually in the forecast period 1985 to 1992. Quebec and Ontario are both expected to experience output growth of over 3%, and British Columbia should experience 4.1% growth, but New Brunswick's growth is expected to be lower than average at 2.2%.



Industry is somewhat optimistic about future output levels, as most representatives believe that output levels will meet or exceed the reference case scenario* illustrated above.

PRODUCTIVITY

Productivity growth during the 1974 to 1979 period averaged 1% annually, fell until 1982, but then increased to an average 8.8% per year from 1982 to 1984, and has increased steadily since. COPS expects productivity (calculated as output per employee per year) to grow at a moderate rate of approximately 1.5% per year from 1987-1992. To a certain degree, the rapid increases in productivity between 1984 and 1987 represent the return to normal levels of production after the declines of the early 1980s, but further productivity gains are expected as the modernization of mills takes place.

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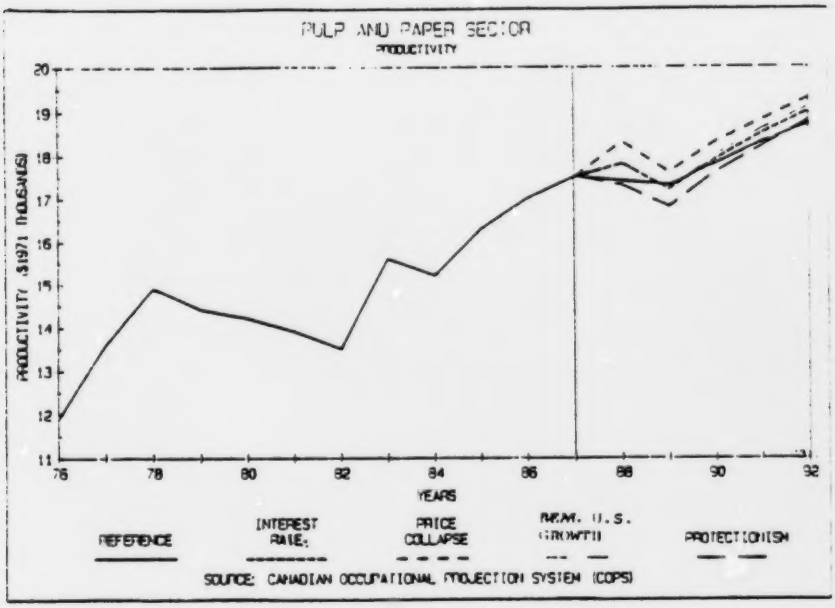
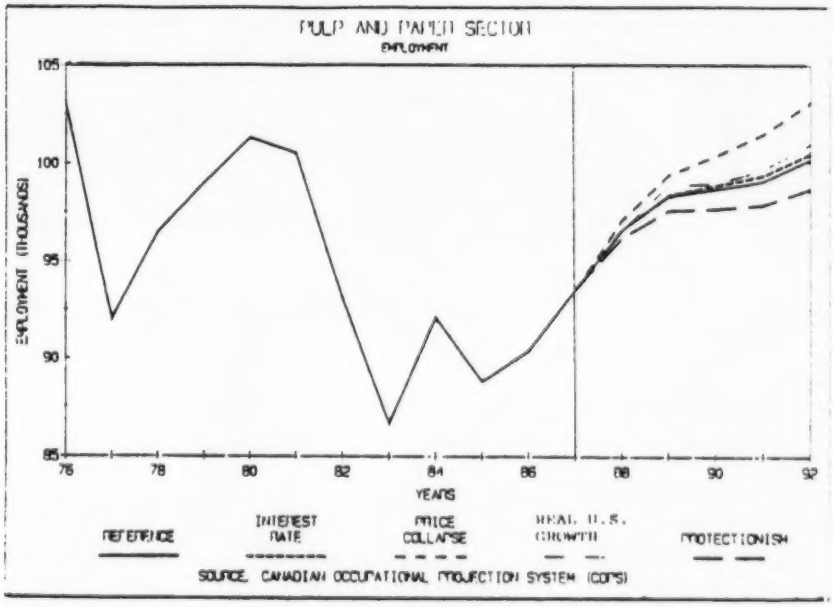
* See Appendix III for a detailed description of each scenario.



Industry representatives generally agree with the productivity projections generated by COPS. COPS expects that Ontario and Quebec will experience the greatest productivity growth of the major producing provinces, at about 2.2%. The same forecast suggests that New Brunswick's productivity growth will be about 1.6%, while Nova Scotia and British Columbia will experience a productivity growth rate of about 1.5%.

IV EMPLOYMENT AND OCCUPATIONAL INFORMATION

The need to restructure large parts of the pulp and paper sector in order for the sector to survive and grow in the future, has had, and will continue to have, a large impact on its workforce. Many of these changes have already been mentioned, but their effects on employment structure and levels have not been explicitly expressed.



Employment levels in the pulp and paper sector have fallen from the mid-1970s. The sector employed 103,000 people in 1976, and this has declined to about 93,000 in 1987. COPS estimates that employment in the pulp and paper sector will grow very moderately at an average of 1.1% per year from 1987 to 1992, which means that there will be about 100,000 employed in the sector.

COPS forecasts that Nova Scotia will see the strongest employment growth. Ontario will experience the next highest growth rate, while British Columbia is expected to show a slight decline in employment. Pulp and paper

representatives suggested that employment levels in Ontario and Quebec could be lower if further rationalization at old existing mills were implemented. COPS expects strongest employment growth to occur during the 1986 to 1988 period. Growth will flatten in 1988-89 as a result of an expected downturn in growth in the United States, and then will increase slowly over the rest of the projection period.

COPS has also generated additional projections of employment levels, based on economic variables such as increased American protectionism, high U.S. economic growth, and a collapse of prices. Industry representatives expect employment levels to fall between the levels projected in the more negative scenario of increased American protectionism and the reference case. That is, they expect that there will be about 100,000 jobs in the pulp and paper sector by 1992.

Pulp and paper representatives consider employment growth to be problematic, due to rationalization and technological changes. While these changes are expected to continue for the next while, their impact on overall employment levels will not be as severe as it was during the late 1970s and early 1980s. On the other hand, changes in the global economy affecting export levels of the sector's goods could well have a negative effect on overall employment levels. Protectionism, increased competition, volatile exchange rates, and free trade with the U.S., should such an agreement be made, will all, depending upon their outcomes, have an important effect on the number of jobs available in the sector. On the positive side, as new pulp and paper plants come on stream, as the sector starts to realize the benefits of changes that it has undertaken and if strong demand for higher grade papers continues, the pulp and paper sector may see a significant increase in overall employment.

While both COPS and pulp and paper sector representatives expect overall employment in the sector to increase over the forecast period, employment levels in many individual occupations will fluctuate, because of technological changes and changes in intensive forest management. The COPS study has helped industry to pinpoint the occupations which will be affected by these changes, so that the sector, as well as government, labour and training personnel can

effectively plan for human resource requirements for the 1990s. There will be more jobs in some of these occupations; others will be very new to the sector. Certain other occupations will experience a decline in employment. Each of these situations requires human resource planning — training for new occupations, retraining personnel in declining occupations, etc.

OCCUPATIONAL PROFILE

COPS projects that overall employment levels for production workers will increase moderately, as shown in charts located in Appendix V. However, employment growth is projected to occur in the higher-skilled occupations such as paper product fabricating and assembling, pulp making and finishing, mechanics and repairmen, while little growth is expected in packaging, truck driving, and some labouring positions. Industry agrees with these predictions and adds that labouring occupations in general, and cellulose pulp preparing occupations will be prone to replacement by mechanized means of processing.

For professional, office and sales workers, also shown in charts in Appendix V, COPS projects that employment growth will be minimal. Industry representatives support COPS projections for many of these occupations, but feel that growth in engineering technicians and industrial engineers occupations will exceed COPS projections. Systems analysts and other computer occupations may also experience growth higher than that projected by COPS. Computerized accounting systems and more efficient word processing systems could lead to a reduction in employment for bookkeepers, accounting clerks, secretaries and stenographers. On the other hand, these categories could also expand due to new production facilities. These conflicting factors make it difficult to anticipate employment levels.

The general overall trend confirmed by pulp and paper sector representatives is the permanent shift away from a less-skilled towards a more highly-skilled workforce. Industry emphasizes that as far as possible, job changes and eliminations will take place through progressive early retirement, attrition and retraining programmes. It was noted that the retraining of existing staff

and cooperative workforce adjustment planning is essential to minimize job displacement. This is not to say that occupations related to production are in sharp decline, but in the future, there will be more jobs for highly-skilled, and multi-skilled workers.

The pulp and paper representatives were asked whether or not they saw new occupations emerging as a result of technology or other factors, whether multi-skilling (the combination of old and new skills into one occupation) was occurring and whether any occupations were gradually disappearing. It was noted that changes in technology have produced a new occupation, that of the electronic electrician; and that the foreman of the future will likely be required to be a highly qualified professional with computer, electronic and production management skills.

Production floor occupations and traditional trade designations are areas where multi-skilling is already ongoing. Production workers are being trained on different types of equipment, and as electricians and industrial mechanics, so that they will be able to perform some of the functions of these other occupations.

It has already been noted that manual-labour positions and positions conducive to automation will decline in the future. However, one respondent believes that no entire occupation will disappear completely: there will still be positions for labourers, for example, but these positions will be far fewer.

There is no question that technological changes are the primary reason behind this shift in the profile of the workforce, but there are also other factors involved. For example, changes taking place in markets in terms of product mix and levels of demand are causing more emphasis to be placed upon higher value added products and new product research. This has led to an increase in product research and development, and also to a change in production equipment and processes. As a result, existing workers have been retrained on more advanced equipment, and more electrical, process, mechanical and chemical engineers and technicians have been hired.

LABOUR MARKET CONDITIONS AT THE OCCUPATIONAL LEVEL

Given these changing labour requirements, the pulp and paper sector must ensure not only that it will be able to retrain existing workers, and offer early retirement, but also that it will be able to recruit a sufficient amount of the highly-qualified and skilled labour that it requires. COPS has examined the overall occupational labour market conditions within which the sector will be competing in workforce recruitment.

There are a number of factors which determine how successful the industry will be in meeting its occupational needs. Two major factors are the growth of competing industries and the competitiveness of industry wages. To assess these two factors, COPS has divided occupations (identified in Census data 1981) into three categories according to expected difficulty of recruitment:

- occupations for which recruitment could be difficult;
- occupations for which recruitment could be somewhat difficult;
- occupations for which no difficulty in recruitment is expected.

The complete COPS assessment is located in Appendix VI. In the first occupational category, there are two factors which are expected to lead to recruiting problems. First, major industries competing to recruit in the same occupational area are projected to grow faster than the predicted 2.5% average growth rate in output for the Canadian economy as a whole over the 1987 to 1992 period. This situation will presumably cause an increase in demand for these positions. Second, wages of the pulp and paper sector are already as high or higher than those of competing industries. This means that the sector will have less flexibility to increase wages further in order to attract the necessary workers. Occupations falling into this category are industrial engineers, engineering technicians and electrical engineers.

For occupations in the second category, major competing industries will grow at least as fast as the overall economy but wages of the pulp and paper sector are generally lower than its competitors, so the sector has wage flexibility to attract workers. Occupations in this group include mechanical engineers and chemists. In the case of chemical engineers and utilities equipment operators, the opposite situation exists: growth of competing industries is expected to be relatively moderate, but pulp and paper wages are noticeably higher.

In the third grouping, the growth rate of competing industries is expected to be equal to or lower than the national average growth rate, and wages in the pulp and paper sector are lower than those in competing industries. The industry faces less competition for labour and at the same time, has some flexibility to increase wages to attract labour if necessary. These occupations include physical science technicians and life science technicians.

The average wages offered by the pulp and paper sector in 1981 were the highest of competing industries in many cases, perhaps due to recruiting difficulties faced by the sector. Because of these already high wages, which imply less flexibility to increase wages in the future, and the expected high growth of competing industries, the pulp and paper sector could encounter recruiting problems in several key occupations, and experience some difficulty in a few others. All of these occupations in which recruitment problems are expected to occur are high-skilled occupations.

While recruitment problems are not generally occurring at the present time, pulp and paper representatives concur that recruitment will become more competitive in the future, and that the sector will have problems hiring people in some occupations, notably engineering technicians. Due to continued emphasis on automation and production integration, process and systems engineers and systems analysts are additional professions which the sector expects may pose recruitment difficulties. To help with these expected problems, many companies within the sector are part of an informal referral system, should skilled personnel be available in one company to be hired by

another. In general, though, recruitment problems are expected to be temporary rather than chronic.

The process of change occurring in the pulp and paper sector is altering the nature of the workplace. Future trends include a shorter work week to retain workforce levels (job sharing), early retirement programmes, retraining of older workers to help them adapt to new technologies, multi-skilling, new occupations, and a decline in jobs in some established occupations. The sector representatives stressed the need for a more co-ordinated approach by employers, unions, governments and other participants in the labour adjustment process, in order to most effectively employ its most important resource: its labour force.

APPENDIX I

THE CANADIAN OCCUPATIONAL PROJECTION SYSTEM

The starting point for the COPS projection of occupational requirements to the year 1992 is a set of impact scenarios, for the economy as a whole, which presents possible alternate growth paths for macroeconomic variables - inflation, production, wage rates, productivity, etc. - that reflect views ranging from pessimistic to optimistic about future economic conditions. Factors considered include:

- -the assumed strength of the U.S. economy;
- -the degree of consumer confidence;
- -movement in energy prices;
- -shifts in population and changes in interest rates.

Sets of detailed industry output, productivity and employment projections are then generated, corresponding to the most likely scenario. Industry employment projections are finally converted into estimates of detailed occupational requirements on the basis of observed occupational structures of industries at the time of the 1981 Census. Therefore, occupational employment projections presented in this document are based on the premise of fixed occupational structures for the pulp and paper sector throughout the projection period. These projections depend, then, on rather restrictive assumptions. Wherever possible, provincial analysis is included and wherever historic data are used, the latest possible numbers are employed.

Although the information COPS has produced in this way may be useful in its own right, it lacked the benefit of the advice and judgment of knowledgeable representatives of the sectors themselves. This document, then, was conceived to stimulate such input. Participants in the consultative process were asked for their views on a number of aspects of their sector. The specific questions asked are listed below, and their responses were integrated into this report.

QUESTIONS

Question I

Do you feel the present industry grouping is the most appropriate and beneficial to your data and planning needs? If not, please detail what industries should be included or excluded.

Question II

Do you agree with this profile of your industry? Do you foresee any major change in your industry structure in the medium term?

Question III

Do you feel the industry linkages section provides an accurate description of your current major markets and suppliers? Do you foresee any major change in this market structure over the medium term?

Question IV

Do you feel the background outlined is a reasonable description of the environment and major issues facing your industry? What other factors or economic influences do you think could affect the future growth of your sector?

Question V

Which scenario of the reference, pessimistic or optimistic cases best reflects your view of the future in terms of world and domestic demand for your products?

Question VI

A) Does the pattern of productivity changes projected in your sector appear reasonable in light of what you know about technological developments and changes in product mix?

B) What technologies do you feel will be most significant in the future and how significant do you expect their impact to be on total employment?

Question VII

Do you foresee any events that could alter the regional pattern projected for your sector?

Question VIII

A) Do you expect the labour force composition as presented for 1981 in Appendix V and VI will change over the next ten years or so? Will there be entirely new occupations emerging in your sector either through new skill needs related to technologies or through combination of old skills

into one occupation (multi-skilling)? Will some occupations gradually disappear from your industry?

B) Please detail the reasons, (technological, demographic and/or market) for the changes you listed in section A. We are particularly interested in what technological innovations will affect occupations in the next ten years.

Question IX

According to our analysis, labour markets are getting tighter in virtually all key occupations in the pulp and paper sector. Have you recently experienced recruitment difficulties in these or other occupations? (Please specify).

Question X

According to our analysis, future recruitment difficulties are likely to occur for industrial engineers, engineering technicians, and electrical engineers. Do you foresee any recruitment/hiring difficulties in these or other occupations? (Please specify).

Question XI

A) Do you consider these issues important for your sector? What other issues, if any, would you consider important?

B) Is future technological change an important consideration and if so, what type of change is anticipated and what effect is it likely to have?

APPENDIX II

COPS - AN IN-DEPTH VIEW

Purpose of the Canadian Occupational Projection System

The basic purpose of COPS is to assess the extent to which occupational imbalances seem likely to prevent the economy from achieving its growth potential. This recognizes that a primary role of labour market information is to help improve output and employment growth by speeding up labour market adjustment processes, eliminating manpower "bottlenecks", and addressing the problems of excess labour supply.

COPS Economic Outlooks (Macro-Scenarios)

The outlook for labour market conditions is closely related to the broad outlook for the economy as a whole. The starting point for the approach is, therefore, a projection of economic performance in Canada over the appropriate future time period. Moreover, skill needs depend not only on the broad outlines of economic growth; they are also very sensitive to the industrial composition of that growth. Thus, the projections contain considerable detail on likely changes in the industrial composition of output and employment.

The system seeks to assess the labour market implications of potential economic growth paths. The exercise therefore begins by developing several plausible economic outlooks, using alternative assumptions about economic policy. In this way, the impact of different outlooks on the distribution of skill requirements can be tested.

Projections of Demand for Skills

Having derived consistent projections of output by industry, the next step is to translate these output projections into employment and skill projections. At present, this translation is done using the industry/occupation relationships derived from the 1981 Census. These relationships are also modified on the basis of post trend changes, judgmental inputs, and special sector studies relating to the future.

Labour Supply

Although the data in this report are essentially taken from the labour demand side of COPS, the labour supply side is an important component of the system.

Information on the labour supply consists mainly of the following:

a) 1971 and 1981 Census of Canada data on:
   - experienced labour force;
   - average age;
   - average years of schooling.

b) Unemployment Insurance Claimant data;

c) Immigration data;

e) Attribution estimates;

f) Apprenticeship completions

d) Training Development data;

APPENDIX III

COPS IMPACT SCENARIOS SUMMARY

Reference Case

Economic performance in this outlook sees U.S. growth projected to average 3% annually through the near-term (1986-90) and to moderate only slightly to 2.8% during the next five years. Tightening labour markets, an OPEC price rebound, and the lagged effects of a depreciating currency are assumed to accelerate inflation in 1988-89; as a consequence, price growth averages 3.9% through the remainder of the 1980s and accelerates to 4.9% annually over the 1991-95 period. In spite of this somewhat stronger inflation view, nominal interest rates are presumed to remain unchanged, resulting in a modest decline in U.S. real rates.

Near-term Canadian economic growth is expected to slow somewhat, particularly in the areas of residential investment and consumer demand, in the face of a reduced domestic population. The positive effects of an improved trade performance and stronger business investment in the non-primary sectors will be partially offset by a sharp deceleration in consumer demand growth - particularly for autos - over the near term. These effects yield overall economic growth of only 2.6% in 1987 and a marginal improvement in 1988 (to 2.9%) before a sharp, U.S.-induced slowdown in 1989. Led by business investment and consumer expenditure growth, the Canadian economy makes a strong recovery during the early 1990s, achieving overall annual growth of 2.9% through the 1991-95 period.

Stagnant increases in real disposable income per capita and an assumed reduction in Canada's population (arising from different demographic and net immigration assumptions) limit aggregate consumer spending to less than 2% annually through the near term. Similarly, residential investment is also considerably weaker in 1986-87, as housing starts are expected to reach 175,000 units in 1986 and fall slightly to 170,000 units in 1987. A population base which is 133,000 persons smaller in 1990 (resulting in 83,000 fewer

households) and 153,000 persons smaller by 1995 (111,000 fewer households) further restrains housing starts and consumer expenditure in this outlook, in spite of reduced real interest rates.

A stronger rate of U.S. inflation yields a positive terms-of-trade effect for Canada, contributing to an improved real net export (and current account balance) position, particularly during the early 1990s. Disaggregating this kind of macroeconomic environment into its industrial effects, COPS finds that trade-sensitive producing sectors - particularly for semi-and fully-processed goods - benefit more than those oriented to serving the domestic market. In this outlook, more modest primary commodity price gains dampen economic prospects somewhat in the agriculture, fishing, forestry and mining sectors. Even though an improved trade position stimulates the manufacturing sector, weaker domestic consumer demand offsets these gains, weakening the industry overall.

Overall employment growth in this outlook only matches increases in the labour force in the second half of the 1980s in spite of only modest productivity gains and virtually no change in overall labour force participation rates. As a consequence, the unemployment rate is not projected to fall below the 9% level until the early 1990s. The anticipated strengthening of economic activity during the 1990-95 period - in conjunction with an improved productivity performance which provides real income gains and boosts demand - provides employment opportunities sufficient to begin reducing the number of unemployed, though the unemployment rate remains stubbornly above 8%.

The inflation outlook in the reference case assumes modest acceleration in U.S. prices has an inflationary effect on Canadian imports, but this only marginally increases the rate of domestic inflation. With annual increases in nominal labour compensation expected to remain in the 4% to 5% range, steady interest rates, and modest increases in primary commodity prices, consumer prices in Canada are expected to increase by an average 3.5% per year through the balance of this decade and into the early 1990s.

Impact of Increased U.S. Protectionism

As one would expect, unilateral U.S. protectionist measures sharply reduce the level of real Canadian economic activity. As in the other impact cases, the trade and inflation performance is dominated by foreign exchange adjustments. The assumed significant decline in real exports creates downward pressure on the exchange value of the Canadian dollar as the current account balance deteriorates in the first year of the impact. This effect is reinforced by an emerging weaker relative growth performance and higher inflation in Canada. The resulting depreciation is reflected in considerably higher import prices, contributing to higher inflation in general in Canada.

As inflationary pressures emerge, real disposable incomes are squeezed, leading to a sizable decline in real consumer expenditure. Further, as the pace of industrial activity slows in Canada in response to the shock, so too does the rate of business capital formation. Consequently, the volume of imports is also markedly lower in this impact case as a result of these demand effects (income effect), as well as a relative price effect which induces a certain degree of import substitution.

While the depreciation of the Canadian dollar provides a comparative trade advantage to Canadian exporters (particularly for price-sensitive commodities), the inflationary effects of the depreciation yield a moderate increase in unit labour costs, thereby limiting Canadian competitiveness and, hence, export opportunities. Overall, the real net export effect is relatively small (with the lower volume of imports offsetting reduced exports).

Impact of Stronger U.S. Real Growth

As one would expect, Canada benefits both directly and indirectly from stronger real U.S. economic growth. Led by the impact on real exports, real GNP increases 0.9% ($1.5 billion) above base case levels by 1991 and remains virtually steady thereafter. Further, an induced depreciation of the Canadian dollar dampens import demand and provides an extra boost to real exports. The resulting increase in domestic production in turn generates a need for capital expansion, causing real business investment to increase more than 1% above base case levels by 1992 before tapering off thereafter. Very modest dis-

posable income gains yield only a small increase in real consumer expenditure in this scenario.

The assumed expansion of U.S. economic activity also generates a moderate inflationary impact in Canada. Although domestic cost pressures remain largely in check, there emerges a strong depreciating effect on the Canadian dollar. This depreciation may seem somewhat counter-intuitive at first, for the improvement in the current account balance, which results from expanded trade, will tend to lead to an appreciation of the Canadian dollar. However, the initial pressure on the dollar is a result of a proportionately stronger U.S. growth acceleration compared to Canada. The depreciating effect of this differential in turn results in a marked increase in import prices, creating inflationary pressures in Canada. This inflationary effect is then picked up in wage formation, leading to a decline in Canadian competitiveness as labour costs increase relative to the U.S. Hence, weaker relative growth prospects and higher inflation in Canada, together with a deterioration in the terms of trade, dominate the current account balance effect and result in downward pressure on the dollar.

One characteristic of this impact which was not adjusted for is a significantly higher level of oil imports resulting from increased Canadian production requirements (induced response) and increased Canadian exports (assumed response) in the absence of increased Canadian production. For this impact, domestic production was not assumed to increase to meet demand, for it would give rise to the issue of increased oil and gas investment activity to achieve this increased production. Adjusting in the area would have clouded the foreign trade effect signals from enhanced U.S. activity.

Impact of a Commodity Price Collapse

The overall characteristic of this scenario is one of moderately stronger real growth and a significant increase in inflationary pressures. Most of this impact derives from exchange market adjustments, whereby the Canadian exchange rate depreciates 3.3% in the first year of the impact; this effect is sustained throughout the impact period, leaving the dollar over 5% below base

case levels by 1995. Since this foreign exchange effect dominates the nature of this impact, it is important to recognize its source.

The initial assumed commodity price shock results in a sharp decline in Canada's current account balance position; this has a depreciating effect on the value of the Canadian dollar, and is reflected in significantly higher import prices, and hence overall domestic inflation. These domestic price pressures are, in turn, incorporated in wage rate formation, leading to higher Canadian unit labour costs and a deterioration in Canada's competitive position with the United States. Consequently, the combination of a deteriorating current account balance, increasing domestic inflation, and a deterioration in Canada's terms of trade, offset only slightly by an improved relative growth performance, yields a sharp and sustained depreciation of the Canadian dollar throughout the impact period.

The level of real economic activity increases quite significantly in the first two years of the impact (0.7% by 1989) as real imports post a sizable decline and lower levels of consumer expenditure are offset by increased exports and business investment (both residential and non-residential). Although higher rates of inflation cause real disposable income to decline in this impact, residential investment is stimulated by the resulting decline in real interest rates. Over the longer term of the impact, real net exports remain significantly above base case levels, but continued weakness on the part of consumers and government and a fall-off in business investment serve to weaken the overall economic impact, leaving real GNP 0.35% above base case levels by 1995.

One secondary characteristic of this impact warrants noting, for the result may seem counter-intuitive. The induced depreciation of the Canadian dollar effectively raises world oil prices, as expressed in Canadian dollar terms. Consequently, this has a positive effect on the level of oil and gas investment in Canada since the industry's cash flow position is improved. Although oil and gas were not in the set of commodity prices which was subject to the exogenous price shock, one might not have expected activity in this sector to be positively affected when other primary sectors were contracting.

APPENDIX IV

OCCUPATIONAL DEFINITIONS

8250 - FOREMEN, PULP AND PAPERMAKING AND RELATED OCCUPATIONS

This unit group includes occupations, as described under the master title, 01-250 SUPERVISOR/FOREMAN (any ind.), concerned with supervising and co-ordinating activities of workers engaged in converting cellulose materials into pulp, and making and finishing paper and pasteboard.

8584 - INDUSTRIAL, FARM AND CONSTRUCTION MACHINERY MECHANICS AND REPAIRMEN

This unit group includes occupations concerned with repairing and servicing a wide variety of industrial machinery, such as that used in printing, textile manufacturing, mining and in other production processes; material-handling and conveying equipment, farm machinery, such as combines, ploughs, mowers and milking machines; construction equipment, such as bulldozers, graders and cranes; and gasoline and diesel engines associated with industrial, farm and construction machinery. Activities include: diagnosing, disassembling, replacing parts and assemblies, reconditioning, aligning, fitting, reassembling and adjusting to specifications, using common and special hand and power tools and equipment.

9539 - STATIONARY ENGINE AND UTILITIES EQUIPMENT OPERATING AND RELATED OCCUPATIONS, N.E.C.

This unit group includes occupations, not elsewhere classified, concerned with activities related to the generation and distribution of electricity, and the operation of stationary engines, utilities, pumping and pipeline equipment.

8593 - PAPER PRODUCT FABRICATING AND ASSEMBLING OCCUPATIONS

This unit group includes occupations concerned with fabricating and assembling paper products; such as, paper bags, boxes, containers, liners and similar items. Activities include: winding, corrugating, facing, folding creasing, sewing, gluing, cutting, stapling and fitting interlocking parts.

8258 - OCCUPATIONS IN LABOURING AND OTHER ELEMENTAL WORK, PULP AND PAPERMAKING
This unit group includes occupations in labouring or other elemental work, as described in the term title, 02-190 LABOURER/ELEMENTAL WORKERS (any ind.) in pulp and papermaking which are concerned with activities such as feeding conveyors and hoppers, cutting wet pulp, washing screens, collecting broke, sorting rags, and performing general clean-up duties.

8253 - PAPERMAKING AND FINISHING OCCUPATIONS
This unit group includes occupations primarily concerned with operating and tending equipment that makes paper, paper pulp and paperboard from pulp slurry, and imparts gloss and finish to paper. Activities include: forming sheets of wet pulp, drying, pressing, calendering, winding, cutting, glazing and impregnating with coating mixtures and laminating paper and other materials.

8259 - PULP AND PAPERMAKING AND RELATED OCCUPATIONS N.E.C.
This unit group includes occupations, not elsewhere classified, concerned with making pulp and paper and related products, and includes making paper wads used in ammunition manufacture.

8251 - CELLULOSE PULP PREPARING OCCUPATIONS
This unit group includes occupations primarily concerned with operating and tending equipment that reduces logs, rags, scrap pulp, and similar cellulose materials to pulp slurry. Activities include: grinding, shredding, mixing, screening, cleaning, cooking and bleaching pulp material.

9317 - PACKAGING OCCUPATIONS, N.E.C.
This unit group includes occupations, not elsewhere classified, primarily concerned with such activities as assembling containers; covering articles or goods with protective materials; cleaning, and closing packages; setting up, operating and tending a variety of machines that fill and seal containers, or wrap, bundle and bale products and materials; and preparing and packaging occupations wherever they occur except when packaging constitutes an integral part of processing such as canning or freezing fruits, vegetables or fish.

9175 - TRUCK DRIVERS

This unit group includes occupations concerned with operating trucks, tractor-trailers and similar vehicles powered by gasoline or diesel engines, over short or long distances, to transport goods and materials.

8256 - INSPECTING, TESTING, GRADING AND SAMPLING OCCUPATIONS, PULP AND PAPERMAKING

This unit group includes occupations in inspecting, testing, grading and sampling work, as described under the term titles, 02-170 INSPECTOR (any ind.), 02-430 TESTER (any ind.), 02-150 GRADER (any ind.) and 02-330 SAMPLER (any ind.), concerned with quality control activities in pulp processing, pulpboard manufacturing and papermaking.

9921 - OCCUPATIONS IN LABOURING AND OTHER ELEMENTAL WORK N.E.C.

This unit group includes occupations, not elsewhere classified, concerned with activities in labouring and other elemental work. The work performed in the occupations of this unit group relates to more than one major group or cannot be classified in any other major group. Examples are:

factory labourer - any ind.
floor worker - n.e.c.
labourer - n.e.c.
odd-job labourer - any ind.
pipe cleaner - any ind.
pit worker - any ind.
sand shoveler - n.e.c.
shop worker - any ind.
street cleaner, manual - any ind.
tool chaser - any ind.
water carrier - any ind.
yard hand - any ind.

2117 - PHYSICAL SCIENCES TECHNOLOGISTS AND TECHNICIANS

This unit group includes occupations as described under master title 01-220 PHYSICAL SCIENCES TECHNOLOGIST (prof. & tech., n.e.c.) and 01-210 PHYSICAL SCIENCES TECHNICIAN (prof. & tech., n.e.c.), concerned with carrying out technological and technical functions in a physical science specialization, such as physics, chemistry, geology, geophysics, meteorology or astronomy, using a knowledge of scientific and mathematical principles and laboratory practices.

2147 - MECHANICAL ENGINEERS

This unit group includes occupations concerned with applied research, development and design of mechanical equipment and its manufacture; supervision of the operation, maintenance or repair of machines that produce, transmit or consume power or energy and the tools with which machinery and equipment are made, and evaluation of installed plant and processes related to machines. Typical areas of specialization include: heating, air-conditioning, refrigeration, automotive, tool and power engineering.

2145 - INDUSTRIAL ENGINEERS

This unit group includes occupations concerned with the design, initiation and development of production procedures to manufacture units in large quantities of high competitive quality, while maintaining low production overhead and safe and efficient operations. Typical areas of specialization include: plant lay-out, production methods and standards, cost and quality control and industrial safety.

1143 - PRODUCTION MANAGEMENT OCCUPATIONS

This unit group includes occupations concerned with carrying out managerial and administrative activities, as described under the master title, 01-170 MANAGER (prof. & tech., n.e.c.) such as directing and co-ordinating production departments, divisions or other organizational units, through subordinate managers and supervisors, in an industrial, commercial, governmental or other organization.

2183 - SYSTEMS ANALYSTS, COMPUTER PROGRAMMERS AND RELATED OCCUPATIONS

This unit group includes occupations concerned with planning, implementing and controlling electronic data-processing services and the programming of computer systems. Typical areas of specialization include analysis of computer systems, and providing advice on availability and use of electronic data-processing resources, capabilities and technological development.

2165 - ARCHITECTURAL AND ENGINEERING TECHNOLOGISTS AND TECHNICIANS

This unit group includes occupations, as described under master titles 01-080 ENGINEERING TECHNOLOGIST (prof. & tech., n.e.c.) and 01-070 ENGINEERING TECHNICIAN (prof. & tech., n.e.c.), concerned with carrying out technological and technical functions in an engineering specialization; such as chemical,civil, electrical, industrial, mechanical, metallurgical, mining, petroleum, aeronautical and nuclear engineering, or in architecture, using a knowledge of architectural, engineering, scientific, mathematical and draughting design principles and practices.

2142 - CHEMICAL ENGINEERS

This unit group includes occupations concerned with research and design, and development of manufacturing processes in which chemical changes occur; and supervision of the construction, operation and maintenance of chemical plant equipment. Typical specializations include: oil and metals refining; explosives, medicinals and pharmaceuticals development; pulp and paper production and food processing.

2144 - ELECTRICAL ENGINEERS

This unit group includes occupations concerned with the design, construction, maintenance and repair of systems which generate, transmit, distribute, control and utilize electric energy; research into electronic products; and provision of technical direction in the manufacture of a wide variety of electrical and electronic equipment; such as communications equipment for telephone, radio, television and satellite systems, automatic control systems and computers, domestic equipment and other labour-saving devices. Typical areas of specialization include: electric power systems, telephone, illumination, communication, audio and electronic-power systems.

2111 - CHEMISTS

This unit group includes occupations concerned with conducting basic research to extend the knowledge of the science of chemistry, and with conducting applied research to develop new or improved materials, compounds and substances for commercial purposes; developing analytical methodology and techniques, and performing quantitative and qualitative analyses and experiments in organic, inorganic, and physical chemistry. Activities include: synthesizing compounds and products; analyzing finished products to determine quality; preparing laboratory reports and compiling data for technical reports.

3313 - PRODUCT AND INTERIOR DESIGNERS

This unit group includes occupations concerned with creating designs for industrial and commercial products and interior decoration, by harmonizing aesthetic considerations with technical and other requirements. Activities include creating designs for a wide variety of manufactured products, such as furniture and furnishings, clothing, textiles, pottery, handbags, shoes, paper securities, and packaging containers; designing interior decorations and planning furnishing of homes, public buildings and other places; setting up advertising displays; designing and laying-out stained-glass windows, and designing sets for stage, motion picture and television productions.

2135 - LIFE SCIENCES TECHNOLOGISTS AND TECHNICIANS

This unit group includes occupations as described under master titles, 01-150 LIFE SCIENCES TECHNOLOGIST (prof. & tech., n.e.c.) and 01-140 LIFE SCIENCES TECHNICIAN (prof. & tech., n.e.c.) concerned with carrying out technological and technical functions in a life sciences specialization, such as botany, zoology, forestry, horticulture or agriculture, using a knowledge of scientific and mathematical principles and laboratory practices.

2311 - ECONOMISTS

This unit group includes occupations concerned with conducting research and developing and applying principles and theories of economics to formulate plans designed to aid in the solution of economic problems arising from production and distribution of goods and services; conducting research into the mathematical basis of the science of economics; developing models to

illustrate and forecast economic behaviour and patterns; devising methods for collection and analysis of economic and statistical data and compiling and interpreting such data; preparing reports and compiling and formulating plans based on studies in economic fields and on interpreted and analyzed data; conducting demographic studies; advising and consulting private industrial concerns or government agencies on matters such as operating efficiency, marketing methods and research, and fiscal problems.

4131 - BOOKKEEPERS AND ACCOUNTING CLERKS

This unit group includes occupations concerned with computing, classifying and recording data to keep sets of financial records; verifying accuracy of records related to payments, receipts and other transactions; posting entries in ledgers; balancing books and compiling reports.

4111 - SECRETARIES AND STENOGRAPHERS

This unit group includes occupations concerned with taking dictation by shorthand writing, transcribing data by typewriter from shorthand notes or dictating machine, making appointments, answering telephone calls and performing general office duties.

APPENDIX V

OCCUPATIONAL PROFILE - PULP AND PAPER

To assist sectors in forecasting their future skill needs, COPS generates projections of employment at the detailed occupational level. Because detailed occupational data are not collected on a regular, annual basis, the approach taken assumes that the individual sector's 1981 skill mix will not change for the rest of the decade, which may or may not be valid. In order to identify how that skill mix might in fact evolve in the next ten years or so in the pulp and paper sector, respondents were asked to pinpoint those occupations whose relative importance would change, as well as the direction and extent of that change. In addition, respondents were asked what factors, whether technological, economic or demographic, would be behind this expected change.

In presenting the occupation material, COPS grouped the five major sub-sectors of the pulp and paper sector. In the following table the most important occupations in terms of labour force share are shown, categorized into two groups: production workers and professional, office and sales workers. In the body of the table are noted for each occupation, the 1971 and 1981 changes in occupational mix as well as the 1985 and projected 1992 employment levels. The growth shown is net growth. Specifically, the figures do not take into account replacement demand for workers who leave because of retirement, industrial and occupational mobility and other such factors.

PULP AND PAPER SECTOR
PRODUCTION WORKERS

CODE		Labour Force Composition 1971 (%)	1981	Projected Employment 1985 ('000)	1992	Change
PRODUCTION WORKERS						
High Skilled						
8250	Foremen	3.99	4.84	4.2	4.8	0.6
8584	Mechanics & Repairmen	5.33	6.91	6.2	7.0	0.8
9539	Stationary Engineer & Equipment Operators	2.49	2.69	2.4	2.7	0.3
Subtotal		11.81	14.44	12.8	14.5	1.7
Semi and Unskilled						
8593	Paper Product Fabricating & Assembling	1.81	0.57	0.6	0.6	0.0
8258	Labouring & Other Elemental Work	9.21	11.79	10.6	12.0	1.4
8253	Pulpmaking & Finishing	7.56	9.35	8.4	9.4	1.0
8259	Pulp & Pulpmaking & Related Occupations	5.89	5.90	5.3	6.0	0.7
8251	Cellulose Pulp Preparing Occupations	4.68	3.50	3.1	3.5	0.4
9317	Packaging	1.58	0.92	0.8	0.9	0.1
9175	Truck Drivers	1.99	1.79	1.6	1.8	0.2
8256	Inspecting, Testing, Grading & Sampling	2.36	2.96	2.7	3.0	0.3
9921	Labouring & Other Elemental Work n.e.c.	1.34	0.51	0.5	0.5	0.0
Subtotal		36.42	37.29	33.6	37.7	4.1

Source: Canadian Occupational Projection System; Statistics Canada, 1971 and 1981 Census of Canada.

PULP AND PAPER SECTOR
PROFESSIONAL, OFFICE AND SALES WORKERS

CODE		Labour Force Composition 1971	1981	Projected Employment 1985	1992	Change
PROFESSIONAL, OFFICE & SALES WORKERS		(%)		('000)		
High Skilled						
2117	Physical Science Technicians	0.71	0.88	0.8	0.9	0.1
2147	Mechanical Engineers	0.55	0.52	0.5	0.5	0.0
2145	Industrial Engineers	0.40	0.55	0.4	0.5	0.1
1143	Production Management	0.27	1.22	1.1	1.2	0.1
2183	Systems Analysts	0.35	0.48	0.4	0.5	0.1
2165	Engineering Technicians	0.26	0.62	0.6	0.6	0.0
2142	Chemical Engineers	0.27	0.29	0.3	0.3	0.0
2144	Electrical Engineers	0.17	0.25	0.2	0.2	0.0
2111	Chemists	0.16	0.20	0.2	0.2	0.0
3313	Designers	0.09	0.07	0.1	0.1	0.0
2135	Life Sciences Technicians	0.06	0.12	0.1	0.1	0.0
2311	Economists	0.08	0.05	0.0	0.1	0.1
Subtotal		3.37	5.25	4.7	5.2	0.5
Semi and Unskilled						
4131	Bookkeepers & Accounting Clerks	1.71	1.88	1.7	1.9	0.2
4111	Secretaries and Stenographers	1.87	1.69	1.6	1.7	0.1
Subtotal		3.58	3.57	3.3	3.6	0.3
SUBTOTAL		55.18	60.55	54.4	61.0	6.6
Other Occupations		44.78	39.39	34.6	39.2	4.6
TOTAL OCCUPATIONS		100.0	100.0	89.0	100.2	11.2

Source: Canadian Occupational Projection System; Statistics Canada, 1971 and 1981 Census of Canada.

APPENDIX VI

INDUSTRY AND WAGE PROFILE - PAPER AND ALLIED PRODUCTS SECTOR

Occupational Labour Market Conditions

One of the main concerns of industry is the possibility of recruitment problems, especially for highly qualified and highly skilled labour. This section examines the overall occupational labour market conditions within which the paper and allied products sector will be competing in the recruitment of its workers.

Current Supply and Demand Indicators

In a couple of occupations listed below, high levels of unemployment existed over the 1982 to 1984 period. This was the case with engineering technicians and life sciences technicians. The UIC-to-stock ratio* for the remaining occupations, however, was under 10%. And,although the UIC-to-stock ratio rose noticeably from 1981 to 1984, by 1984 the ratio had fallen in almost every case. This labour ratio was still higher than that which existed in 1981, so by 1984, the labour supply in key occupations was tighter than during the recession, but not as tight as had existed just prior to the recession.

The National Job Bank** statistics show an increase in the number of registrants from 1983 to 1984 in all but one case, again reflecting the tightening of the labour market in that period.

* UIC-to-stock ratio is the ratio of the number of unemployment insurance claimants with a given occupation to the total number of people in that occupation.

** The National Job Bank is a registry of long term vacancies at Canada Employment and Immigration Centres. The statistics include jobs available to both Canadian and foreign workers.

INDUSTRY AND WAGE PROFILE BY OCCUPATION (1981)

SOC	Occupation	Employer*	Percentage of Total Employment	Annual Average Real Growth	Annual Average Wage**
GROUP ONE					
2145	Industrial Engineers	Business Services	10.2	2.8	$27,000
		Electrical Products	10.0	1.5	$22,500
		Machinery	8.1	2.2	$24,500
		Pulp & Paper Products	0.55	1.0	$28,000
		Other	71.55		
		Total	100.00		
2165	Engineering Technicians	Business Services	13.6	2.8	$17,000
		Public Admin.	10.9	0.7	$18,500
		Electrical Products	10.4	1.5	$16,000
		Pulp & Paper Products	0.62	1.1	$20,000
		Other	64.48		
		Total	100.00		
2144	Electrical Engineers	Electrical Power	20.3	0.0	$24,500
		Business Services	17.6	2.8	$28,000
		Telephone and Telegraph	17.0	0.2	$27,000
		Electrical Products	15.1	1.5	$24,500
		Pulp & Paper Products	0.25	1.1	$29,000
		Other	29.75		
		Total	100.00		
GROUP TWO					
2147	Mechanical Engineers	Business Services	24.2	2.8	$29,500
		Machinery	11.1	2.2	$25,500
		Public Admin.	6.0	0.7	$26,500
		Pulp & Paper Products	0.52	1.1	$28,500
		Other	55.18		
		Total	100.00		
2111	Chemists	Chemical Products	16.9	1.5	$24,000
		Public Admin.	15.9	0.7	$24,500
		Business Services	11.4	2.8	$33,000
		Pulp & Paper Products	0.20	1.1	$25,000
		Other	55.60		
		Total	100.00		

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SOC	Occupation	Employer*	Percentage of Total Employment (1981)	Annual Average Real Growth (1985-92)	Annual Average Wage** (1981)
2142	Chemical Engineers	Business Services	14.8	2.8	$22,000
		Pulp & Paper Products	0.29	1.1	$29,500
		Other	84.91		
		Total	100.00		
9539	Utilities Equipment Operators	Public Admin.	10.8	0.7	$17,500
		Hospitals	8.3	1.4	$18,000
		Pulp & Paper Products	2.69	1.1	$23,500
		Other	78.21		
		Total	100.00		
GROUP THREE					
2117	Physical Sciences Technicians	Public Admin.	18.8	0.7	$17,500
		Business Services	14.8	2.8	$25,500
		Pulp & Paper Products	0.88	1.1	$19,500
		Other	65.52		
		Total	100.00		
2135	Life Science Technicians	Public Admin.	39.2	0.7	$14,500
		Education	16.6	1.5	$12,000
		Business Services	9.0	2.8	$18,000
		Pulp & Paper Products	0.12	1.1	$17,500
		Other	35.08		
		Total	100.00		

* Where the 'other' category is large, this indicates that the occupation is spread over a large number of industries.

** Includes both full-time and part-time workers.

Source: Canadian Occupational Projection System; Statistics Canada, 1981 Census of Canada.